

## Side brush

The invention relates to a side brush, which is adapted to be mounted on the body of a sweeping machine, for use as a brush rotatable about a rotation axis, and which comprises a base element and a plurality of individual bristle segments detachably mountable thereto, having bristles included therein integrated for a solid unit with a frame member joining the same. The base element comprises a substantially planar disc assembly which is provided integrally with a coupling system for coupling the bristle segments therewith on a snap fit principle.

Side brushes of the above type have been traditionally constructed by means of a base element, made for example from a flat plywood panel and having a radially sufficiently wide zone in its outer periphery extending from the center of the base element and provided with pairs of holes in an inclined position. Providing this type of side brush with bristles is effected by threading the bristles in one hole and out of the other, which is followed by clamping the bristles in place for example with a plywood or metal plate fastened to the back of the base element. A downside in this type of solution is particularly the inconvenience of its manufacture, since, first of all, a multitude of paired holes must be drilled in the base element, whereafter the bristles threaded therein must be further clamped in position by means of a back cover. Another notable drawback is that a side brush of the above type is a disposable item, because dismounting bristles from a base element is not economically viable but, instead, replacing the entire side brush with a new one is more convenient.

On the other hand, the implementation of a so-called cassette principle in the above-mentioned context is

presently known. This type of side brush solutions include a base element, which is fabricated e.g. of a rather thin metal sheet by form-bending, such that it is provided with a coupling system in a position inclined relative to the mounting plane of a side brush, which enables a detachable anchoring thereto of bristle segments manufactured in a prefabrication stage. The bristle segments used in this instance are currently manufactured in such a way that the bristles are bound together at one end thereof e.g. by a form-bendable base element of sheet metal, which is slippable in slots functioning as a coupling system. One optional solution in this respect is e.g. such that the base element is provided with holes through which the bristles are threaded, whereafter the base element's back face is fitted with an appropriate clamping plate for securing the bristles in place. Another alternative solution is described in US patent 3,678,530, wherein the frame member holding each bristle segment together is constituted by a three-component frame structure, which is then secured to the base element of a side brush.

This type of solutions, based on a so-called cassette principle, are not currently very functional either, firstly due to the fact that the fabrication of bristle segments is laborious and expensive because, first of all, the positioning of bristles in place requires an unacceptable amount of manual labour, in addition to which the bristles must, on the other hand, be manufactured with a quite high dimensional precision in order to fit the same in a respective coupling system by applying a force as little as possible. In practice, however, this causes all sorts of problems in an installation process because of rather large manufacturing tolerances existing in this type of construction for natural reasons. On the other hand, solutions of the above type do not enable

recycling or the reuse of bristle segments included therein without unacceptably laborious/expensive dismounting operations, which is why it is generally necessary to ultimately discard such material to a waste disposal site. In addition, as a result of metal constructions used in association with arrangements of the above type, the base structures of bristle segments become unacceptably massive, wherefor the coupling and bracing systems included in a sweeping machine must also be of a highly robust design.

Another solution has been disclosed in US patent publication 4,236,269, wherein the base element of a vertical axis brush comprises a flat plate structure, which is integrally provided with a coupling system for attaching bristle segments thereto in a snap fit fashion. In this instance, the coupling system consists of clamps formed in the base element, between which the U-shaped bristle segments are attachable. A problem with this type of solution lies particularly in the fact that there is no way of providing a sufficiently reliable clamping for the bristle segments, since no actual locking can be implemented in this discussed solution. For this reason, the positions of bristle segments are also somewhat unstable in the vertical axis brush, firstly as a result of manufacturing tolerances in the bristle segments' U-shape and secondly because the clamps included in the plate or disc are subject to bending in extended use. This aspect in itself is of major importance in terms of holding a vertical axis brush together. Thus, in practice, it is not possible to assemble a sufficiently reliable side brush with the discussed type of solution.

It is an object of a side brush according to the present invention to provide a decisive improvement regarding the above-discussed problems and thus to

raise substantially the existing state of the art. In order to accomplish this object, a side brush of the invention is principally characterized in that the coupling system is implemented by means of elongated channels disposed in the base element in a substantially radial direction and extending through the base element, opening all the way to the edge thereof, which enable coupling the bristle segments immovably to the engagement with the body of a sweeping machine by means of the base element with fasteners interconnecting the same, such as by effecting the attachment in a screw clamping or suchlike fashion.

Among the most important benefits gained by a side brush of the invention should be mentioned the simplicity and efficiency of its manufacture and construction, by virtue of which there is provided an extremely simple manufacturing process and an extremely user friendly installation and replacement of side brushes. In a preferred embodiment, the inventive side brush is provided with bristle segments whose frame members are manufactured from plastics in which the bristles of a bristle segment are secured at one end thereof in a totally fixed manner. In this respect, it is further possible to manufacture the frame members of bristle segments in a first aspect from a fusion produced from the ends of the bristles. Another possibility is naturally to manufacture the frame members from moulded plastics, in which the bristles of a bristle segment are anchored by one end thereof during its solidification, or else from e.g. a chemically solidifying two-component material, such as polyurethane, epoxy or the like.

By virtue of the invention, it is thus possible to manufacture an entirely plastic-structured side brush, which in this context is further modifiable by

compiling the bristle formations of its bristle segments for example from plastic bristles of thicknesses substantially different from each other, which are capable of replacing steel bristles used in traditional solutions. By virtue of the foregoing, the inherently reusable and, on the other hand and if necessary, also recyclable base element, being preferably a totally planar and substantially uniform thickness plate or disc assembly, further minimizes space demand with regard to a sweeping machine, as well as ensures a reliable operation of the side brush during rotation for a total elimination of rotational asymmetry, which is characteristic of traditional solutions. Another essential benefit gained by a side brush of the invention relates to its applicability in connection with presently available sweeping machines without any necessary modifications.

Preferred embodiments for a side brush of the invention are disclosed in the dependent claims directed thereto.

The invention will be described in detail in the following specification with reference to the accompanying drawings, in which:

fig. 1

shows in a perspective view of principle one preferred side brush of the invention, having bristle segments attached thereto,

figs. 2a, 2b and 2c.

show one side brush of the invention in a cross-section along its center line (Fig. 2a) and a bristle segment included therein, in a plan view (Fig. 2b) and in a front view (Fig. 2c),

fig. 3

shows in a plan view one preferred base element included in a side brush of the invention,

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figs. 4a, 4b and 4c

show one side brush embodiment which is alternative to that shown in figs. 1-3, especially with regard to a coupling system, in a halfway cross-section of the base element at its intact portion (Fig. 4a), in a halfway cross-section of the base element at a channel fitted with a bristle segment (Fig. 4b), and in a detail visualizing the base element in a plan view, one of the channels being fitted with a bristle segment,

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fig. 5

shows in a plan view a base element included in the side brush shown in figs. 4a-4c,

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figs. 6a and 6b

show one further alternative side brush embodiment, especially with regard to a coupling system, in a halfway cross-sectional view of the base element at its intact portion, and at a channel included in the base element and fitted with a bristle segment,

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fig. 7

shows in a plan view a base element used in the embodiment of figs. 6a and 6b, and

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figs. 8a and 8b

show, in an overhead view and a front view, respectively, a bristle segment useful in

connection with base elements of the type shown especially in figs. 5 and 7.

5 The invention relates to a side brush, which is adapted to be mounted on the body of a sweeping machine, for use as a brush rotatable w about a rotation axis y, and which comprises a base element 1 and a plurality of individual bristle segments 2 detachably mountable thereto, having bristles 2a' 10 included therein integrated for a solid unit with a frame member 2a" joining the same. The base element 1 comprises a substantially planar disc assembly which is provided integrally with a coupling system for coupling the bristle segments 2 therewith on a snap 15 fit principle. The coupling system is implemented by means of elongated channels U disposed in the base element 1 in a substantially radial direction R and extending through the base element, opening all the way to the edge thereof, which enable coupling the 20 bristle segments 2 immovably to the engagement with the body of a sweeping machine by means of the base element 1 with fasteners 3 interconnecting the same, such as in a screw clamping or suchlike fashion.

25 In reference especially to what is shown in fig. 1, it is possible to use a side brush of the above type e.g. in such a way that screws 3; 3b, fitted in threaded holes 3; 3a present in the base element 1 on the body of a sweeping machine or, if necessary, in a separate 30 mounting plate K, are unscrewed such that the base element 1 is able to descend downwards, whereafter the bristle segments 2 are removable one at a time from the channels U, after which, following the installation of new bristle segments, the base element 35 1 is still attachable by means of the screws 3b in its position, such that the back faces of the bristle segments' frame members 2a" settle against the body of a sweeping machine/the mounting plate K.

In a preferred embodiment, in reference especially to  
figs. 2a, 2b, 2c and 3, the bristle segments 2 are  
adapted to be immovably stationary in a plane x of the  
base element 1 by means of interlocking snap fit  
5 arrangements between the frame members 2a" thereof and  
the base element 1, the channels U present in the base  
element 1 being provided with a necking U1 formed in  
a radial direction at the base element's 1 outer edge,  
whereby the bristle segment 2 to be mounted on the  
10 base element 1 firstly in a lateral direction by way  
of an open end of the channel U and secondly from  
above, is clampable through the intermediary of a  
mating surface arrangement V present in its frame  
member 2a" whose length L is most preferably at least  
15 equal to that of the channel U.

As a solution alternative to the foregoing, figs. 4a-  
4c and 5 illustrate an embodiment different from that  
described above, especially with regard to a coupling  
20 system, in the sense that, as shown in fig. 4a, the  
base element 1 has its top surface provided with a  
recess arrangement SY for a mounting flange k1 set in  
the bristle segment's 2 frame member 2a", said  
arrangement extending preferably in a continuous  
25 manner along the base element's 1 periphery, as shown  
in figs. 4c and 5. In this type of embodiment, the  
bristle segments 2 can be simply descended into  
position in each channel U at the above-mentioned  
recess arrangement SY in such a way that the mounting  
30 flanges k1 for said segments' frame members have their  
ends set against an end flange PL present at the base  
element's 1 outer edge and constituted by the recess  
arrangement. Thereafter the side brush is attachable  
in threaded holes present in the body of a sweeping  
35 machine or in a separate mounting plate K, as shown  
e.g. in fig. 4b, or by means of other such  
arrangements.



In a further solution alternative to those described above, figs. 6a, 6b and 7 illustrate a side brush embodiment different from those mentioned above, especially with regard to a coupling system, which is based on fastening the bristle segments 2, as depicted in fig. 6b, by bracing the mounting flange k1 present in the segment's frame member 2a" against the sides of the channel U present in the base element 1, whereafter the side brush is attachable in threaded holes present in the body of a sweeping machine or, as shown in fig. 7b, in the separate mounting plate K, being supported by a radially directed retaining tab RT included therein.

Figs. 8a and 8b illustrate in a plan view and in a front view, respectively, a preferred bristle segment 2 useful especially in the base element of a side brush shown in figs. 5 or 7.

In yet another preferred embodiment, the substantially elongated and rectilinear bristle segment 2 has its frame member 2a" composed of a fusion produced from the ends of the bristles 2a'.

In a further preferred alternative to the foregoing, the bristle segment 2 has its frame member 2a" made of moulded plastics, in which the bristle segment's bristles 2a' are anchored by one end thereof during its solidification process.

In a further preferred embodiment alternative to the foregoing, the bristle segment 2 has its frame member 2a" manufactured from a chemically solidifying two-component material, such as polypropyleneurethane, epoxy or the like.

On the other hand, the side brush has its base element 1, as shown e.g. in figs. 3, 5 or 7, manufactured from

a substantially rigid-structured plastic, metal, ceramic, composite material and/or the like.

5 In further reference to preferred embodiments as shown especially in figs. 1, 2a, 4b or 6b, the bristle segment 2 has its bristles 2a' arranged at an angle  $\alpha$  relative to the frame member 2a", deviating substantially from a perpendicular direction.

10 In a further preferred embodiment, one or more bristle segments 2 of the side brush are provided with bristles 2a' manufactured from a plastic-based material, such as polypropylene, polyamide or the like.

15 In further reference especially to what is shown in figs. 2a and 2c, the bristle segment 2 has its bristles 2a' in zones I and II composed of at least two types of plastic bristles cross-sectionally  
20 substantially different from each other, which makes it especially possible to improve rigidity of the bristle segments' 2 bristles without using traditional steel bristles. Thus, it is possible to place plastic bristles of different thicknesses as shown for example  
25 in fig. 2a, such that the stronger bristles are located at the outer end of a bristle segment, as viewed in a radial direction R, or else, as shown in fig. 2c, such that the stronger bristles are located on the opposite sides of a bristle segment.

30 On the other hand, in a solution alternative or complementary to the foregoing, it is possible to provide one or more bristle segments 2 of the side brush with bristles manufactured, as mentioned above,  
35 from a metal material, such as steel.

It is obvious that the invention is not limited to the embodiments illustrated or described above, but it can

be modified according to varying demands and operating conditions without departing from the basic inventive concept. Hence, it should be appreciated in the first place that the configuration of a base element may  
5 differ from what is described above, depending on its currently applied coupling with the brush body of a sweeping machine. Secondly, its dimensions and appearance are naturally subject to variations, depending on the dimensions of each manufactured  
10 cassette brush and a material used therefor. On the other hand, it is naturally also possible to provide the side brush with a brush pattern extending along the periphery of the side brush in a more discontinuous way than what is shown in the figures.  
15 Naturally, it is also clear that the coupling system may consist of mating surfaces with a wide variety of cross-sections, contours, and functions for achieving the locking of bristle segments to a base element.